

APPENDIX G: WATER CONSERVATION

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Water conservation has two distinct purposes: 1) temporary reduction in water demand to meet an acute water shortage caused by chemical contamination or drought, and 2) permanent reduction in demand through efficiency improvements (USACE, 1998). Section 2.2.15 of this EIS addresses the potential for meeting Jackson County's projected future water supply needs through long-term reduction in demand from water conservation efforts.

Long-Term Reduction in Demand

Water conservation through permanent reduction in demand first emerged as a priority of Federal water supply policy in the late 1970's. Before that time, most conservation efforts focused on constructing dams to retain and use surface waters for power generation, agricultural irrigation, and municipal water supplies. However, surface water resource development entails high financial costs. Moreover, its environmental costs have come under increased scrutiny as the nation's supply of free-flowing, unpolluted rivers has dwindled (Dixon et al., 1989). Groundwater is both limited in supply and frequently subject to contamination. Thus, since the late 1970's, the nation's water supply planning and management has increasingly emphasized reduction in water demand through a variety of technical, educational, and pricing measures (USACE, 1998).

Once thoroughly integrated into comprehensive water supply planning, water conservation programs typically supplement, but do not entirely replace, the development of new water supplies. Successful water conservation efforts depend both on regulatory action by State and local governments, as well as management decisions by local utilities. These management measures may include regional coordination with other utilities, installation of meters, leak detection programs, rate structure changes, distribution of retrofit kits, and public education (USACE, 1997).

Water consumption is typically broken down into the following end-uses: domestic indoor, residential landscaping, agricultural irrigation, commercial, and industrial. Each of these end-use sectors lends itself to significant reductions in water use through a variety of water conservation methods and devices. Residential and commercial indoor consumption can be reduced by replacing existing appliances and fixtures with newer models, which incorporate water-saving features. For example, water-saver showerheads, low-flush toilets, and water-saving washing machines use 33 to 77 percent less water than their standard counterparts (McNulty et al., 1999). **Table G-1** lists a number of water-conserving alternatives with residential, commercial, and landscaping applications.

Education is also an important water conservation tool. Direct mail, news media, personal contact, and public relations events are a few of the methods government agencies, public interest groups, and water suppliers use to encourage voluntary conservation efforts by water users. Purely voluntary programs relying on civic goodwill may go only so far in reducing long-term demand. The purpose of water pricing policies, on the other hand, is to provide tangible economic incentives for water-conserving efforts. A number of these incentives are listed in **Table G-2**.

Table G-1. Residential, Commercial, and Landscaping Conservation Methods/Devices

Residential and Commercial Water Use Without Conservation Features	Conservation Alternatives
Standard non-conserving toilet	<ul style="list-style-type: none"> • Ultra low-flush or low-flush toilet • Toilet tank displacement dam or bag
Standard non-conserving showerhead	<ul style="list-style-type: none"> • Ultra low-flow or low-flow showerhead • Shower flow restrictor
Standard non-conserving faucet	<ul style="list-style-type: none"> • Low-flow or self-closing faucet • Faucet aerator
Leaky toilet	<ul style="list-style-type: none"> • Leak detection tablets
Standard clothes washing machine	<ul style="list-style-type: none"> • Efficient clothes washing machine
Standard automatic dishwasher	<ul style="list-style-type: none"> • Efficient dishwasher
Current water fixtures and water use practices	<ul style="list-style-type: none"> • Residential water audit • Small/large commercial water audit
High water pressure areas	<ul style="list-style-type: none"> • Water pressure reduction
Non-metered water use	<ul style="list-style-type: none"> • Metered water use
Traditional residential/commercial landscaping practices	<ul style="list-style-type: none"> • Watering guides and watering audits • Automatic timer shutoff for hoses • Low water-using plants • Xeriscaping (low-water landscaping) • Soil moisture sensors

Source: USACE, 1998.

Industrial water use is typically divided into process, cooling, and general use. Process water is used directly by industry in physical, mechanical, and chemical processes. Cooling water is used to lower the temperature of machinery and components during and after industrial processes that generate heat. General use includes everything from cleaning assembled products to mopping floors. While water consumption varies widely from one industry to another, ample opportunity exists for conservation through efficiency improvements (USACE, 1998).

Finally, a number of methods are available for the evaluation of existing water distribution systems to detect leaks, thus minimizing water loss.

If all of the above measures are vigorously and successfully pursued, substantial water savings are achievable. The U.S. Army Corps of Engineers (USACE), Wilmington District (1997) estimated that a conscientious water conservation program could reduce residential and commercial demand by about 15 percent (10 percent due to plumbing code changes and 5 percent due to public education and rate structure changes) and industrial use by about 5 percent. Assuming a mix of 75 percent residential and commercial and 25 percent industrial customers, the total reduction would be 12.5 percent.

Table G-2. Rate Structure as a Water Conservation Tool

Policy	Description
Metering	The monitoring and charging for water based upon the volume used by the customer. Provides valuable information on where and when water is used.
Rate Design	Depending on the price elasticity of water (a measure of users' responses to price changes), and the type of price structure selected, a degree of water conservation can be achieved through new pricing policies.
Marginal Cost Pricing	The practice of setting the price of water equal to its marginal cost, which is the cost to bring a new source of water supply on-line, as opposed to averaging costs of all existing and new sources.
Increasing Block Rates	The practice of setting the unit price for a volume of water and a higher price for the next volume, etc. The cost of the water to a consumer increases at an increasing rate; thus, the incentive to conserve water increases.
Peak Load Pricing	The practice of setting the price of water higher during hours of peak use. Since water systems are designed for maximum flow requirements, this pricing structure recovers the costs from the daily peak load users. Rates are established with volume and peak use components.
Seasonal Pricing	The practice of setting the price of water higher during periods of seasonal high use (i.e., summer) as opposed to lower winter rates. This is similar to the daily peak load pricing strategy, except that seasonal design flow requirements are charged to the seasonal water users.
Summer Surcharge	An additional charge that is added on to a rate structure for the purpose of recovering the delivery costs of summer peak water use.
Excess Use Charge	An additional charge that is added on to a rate structure for the purpose of discouraging water use exceeding some pre-specified level.

Source: USACE, 1998.

Other estimates of potential water savings run somewhat higher. In neighboring Owsley County, it was estimated that projected total demand could be reduced by 20 percent through implementation of public education programs, temporary rationing and sprinkling restrictions during emergencies, industrial and commercial reuse/recycling conservation measures, retrofit of showerheads and toilets, and moderate plumbing code measures (KRADD and CT, No date). Other long-term solutions, such as installing water-efficient fixtures, including toilets and showerheads, have been shown to cut water use by 30 percent (Sullivan, 1999).

Potential for Water Conservation in Jackson County

The Jackson County Water Association (JCWA) does not currently have an active water conservation program (Powell, 1999a). However, existing water consumption rates in Jackson County are already comparatively low. Per capita residential water consumption in Jackson County (JCWA customers) averaged 54 gallons per day (gpd) from 1989 to 1997, compared to the 67 gpd statewide average for Kentucky. Present commercial and industrial use rates are also well below the state average (MEG, 1999c). Thus, the opportunity for present Jackson County

water users to conserve may be somewhat less than in other locales with higher consumption rates.

As discussed in Section 1.2.1 of this EIS, the low, moderate, and high projected water demands calculated for Jackson County, including regional needs, in 2050 are 2.6, 3.5, and 5.4 million gallons per day (mgd), respectively. If an active water conservation program could reduce these amounts by the 20 percent indicated above in the Owsley County study, the low, moderate, and high demand projections would be 2.1, 2.8, and 4.3 mgd, respectively. These reductions show that, while noticeably reducing the increase in projected water use, a concerted water conservation program would not eliminate the need for developing additional raw water supplies.

Environmental Consequences

To the extent that water conservation substitutes for augmenting water storage capacity, it can avoid the direct environmental impacts associated with the construction and operation of a dam and reservoir described in Section 3.0 of this EIS. While the manufacture and installation of water-saving devices does entail certain environmental impacts, primarily from mining and refining metals, as well as from energy consumption, these would tend to be indirect, dispersed, and comparatively small in scale.

However, the cumulative impacts of a water conservation program in Jackson County could be identical to those associated with a reservoir. This would occur if making the same quantity of additional water available through efficiency improvements succeeds in allowing the number of water users to grow at the same rate as with a reservoir project. This enlarged number of residential, commercial, and industrial water consumers would then have several long-term, cumulative effects on the biophysical, social, and economic environment of Jackson County. Cumulative impacts associated with the creation of a reservoir are described in Section 4.0 of this EIS.

Conclusion

Water conservation, if energetically pursued, could reduce the projected increase in water consumption over the next 50 years by approximately 10 to 30 percent. This effect, while considerable, is insufficient to eliminate the need to develop additional water supplies for Jackson County, if the economic development initiatives promoted by the EZ are effective. A water conservation program would avoid the direct environmental impacts of the proposed dam and reservoir, but could still lead to the same long-term, cumulative effects on the environment. In addition, water conservation would not meet the secondary purpose of the Jackson County Lake Project, that of providing lake-based recreational opportunities to meet the present and future demands of the residents of the County and surrounding areas. On the basis of these considerations, water conservation is excluded from more detailed study.